

REMARKS

The application has been amended in manner believed to place it in condition for allowance at the time of the next Official action.

Claims 65-99 are cancelled without prejudice.

Claims 100-124 are new and are directed to the elected invention. For example, independent method claim 100 is directed to subject matter similar to claims 65 and 68, and independent method claim 109 is directed to subject matter similar to claims 65 and 67. Claims 101-108, 110, and 111 recite subject matter similar to claims 70-76, 78, 69 and 77, respectively. Claim 112 also recites subject matter similar to claim 75. Composition claims 113-124 are similar to the subject matter of claims 80, 79 and 81-89, respectively.

Support for the new claims may be found generally throughout the specification, and particularly in the original claims.

The Official Action rejects claims 65-78 and 90 under 35 U.S.C. 101 because these claims recite a use without setting forth any steps involved in the process. The rejection is respectfully traversed.

Currently pending method claims 100-112 do recite steps involved in the method of organic synthesis. Independent claims 100 and 109 both recite the forming of a homogeneous phase with the soluble reaction support and adding a reagent to react with a

functional ion of the soluble reaction support for organic synthesis.

The present specification discloses a homogeneous phase with the soluble reaction support is advantageously utilized in a variety of organic synthesis reactions where a reagent is added to react with the functional ion of the reaction support, e.g., Diels Alder reaction, Heck's reaction, Suzuki coupling, etc. (See Examples and page 17, line 24 to page 38.)

Therefore, claims 100-112 do set forth steps for carrying out the method, and withdrawal of the rejection is respectfully requested.

The Official Action objects to the disclosure. This objection is respectfully traversed.

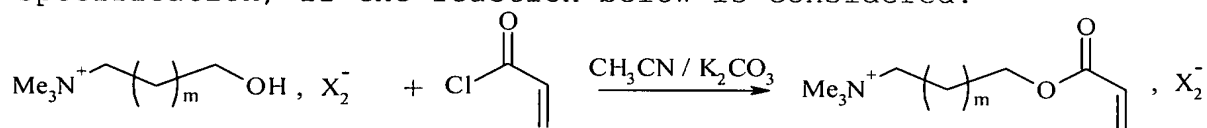
The position of the Official Action is that it is unclear how a functional group, and not the ions, react when the specification teaches the functionalized salt dissolves in the ionic liquid into ions. The Official Action states that pages 6 and 13 teach Y^-F is selected from the anions F, OH, CN, RO and RS, but there is no F group in these ions, they are only Y^- ionic entities. The Official Action questions also how the functionalized salt, which is an ionic liquid, does not dissolve in the matrix ionic liquid, but is miscible with the matrix liquid.

Pages 6 and 13 of the present specification teach that, when k is equal to 0, $Y^-(L)_k-F$ is selected from the anions F,

OH, CN, RO and RS. In that case, there is no F_i group, as the Official Action mentioned. In those cases, the anion is a non-functionalized anion. A functional group is anchored on the cation of the functionalized salt.

As to the issue of the functional group reacting, not the ion, the functionalized salt has at least a functional group on the cation and/or on the anion. Indeed, the functionalized salt dissociates into a cation and an anion when the salt is dissolved in the ionic liquid. However, it is the functional group that reacts in the organic synthesis. This functional group is anchored on one of the dissociated ions. That is why this particular ion does react as well. It is correct to consider that either the functional group or the functional ion on which this functional group is anchored, reacts.

For example, in the example section page 59 of the specification, if the reaction below is considered:



The hydroxyl function reacts and the trimethylammonium cation on which this hydroxyl function is anchored also reacts.

With respect to the functionalized ionic liquid being miscible with the matrix liquid, "miscible" refers to the property of liquids to be mixed together in order to form a homogeneous phase, e.g., as disclosed at the top of page 11 of the specification. When the functionalized salt is an ionic

liquid ("salt or mixture of salts the melting point of which is comprised between -100°C and 250°C" specification page 3), it is miscible in the liquid matrix, and it is soluble in it. The phase is homogeneous.

Therefore, for the reasons discussed above, the present disclosure is clear, and withdrawal of the objection to the disclosure is respectfully requested.

Claims 65-80, 85-89, 90 and 98 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The rejection is respectfully traversed.

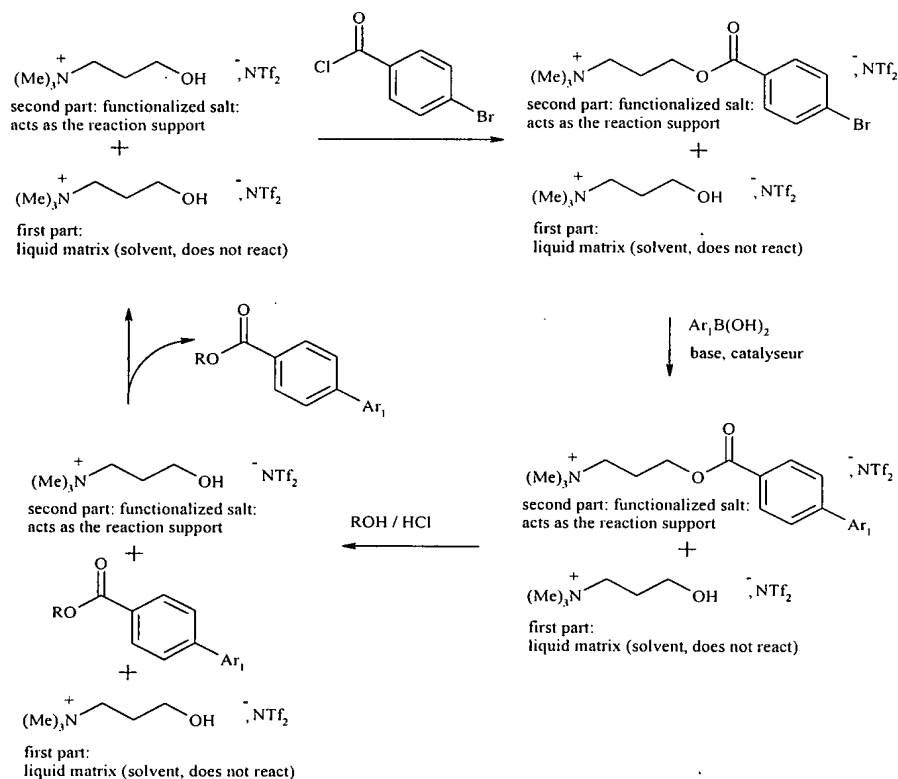
The method claims are rejected for failing to recite a method step. However, as discussed above, method claims 100-112 include the step of forming the homogeneous phase with the soluble reaction support and adding a reagent to react with a functional ion of the soluble reaction support for organic synthesis.

Thus, method claims 100-112 are definite.

The composition claims are rejected for reciting that Y⁻-F is selected from the anions F, OH, CN, RO and RS, but there is no F group in these ions. However, composition claims 113-124 do not recite this feature, and, as discussed above regarding the objection to the disclosure, the specification describes recited properties of k=0 and k=1 on pages 6 and 13, in light of, for example, page 59.

The composition claims are also rejected for reciting that the salt is an ionic liquid. However, as discussed above regarding the objection to the disclosure, "miscible", as used in the present specification, refers to the property of liquids to be mixed together in order to form a homogeneous phase.

Additionally, claim 80 was rejected because the first and second part of the ionic liquid was unclear. Claim 80 is now cancelled, but claim 113 is directed to similar subject matter. Claim 115 recites "a first part...as the liquid matrix" and "a second part...provides the functionalized salt", and A_1X_1 is used as the liquid matrix (first part) and as the functionalized salt (second part). This is illustrated, for example, in example 4 (page 72 of the specification), as shown below:



Thus, in view of the above, the composition claims 113-124 are definite.

Therefore, withdrawal of the rejection is respectfully requested.

Claims 79 and 82 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 4,463,071 (US '071). This rejection is respectfully traversed.

Claims 114 and 116 are similar to claims 79 and 82, respectively. These claims are directed to a stable composition comprising a functionalized salt in a liquid matrix, and the functionalized salt provides a soluble reaction support.

US '071 is offered for teaching a composition comprising an ionic liquid matrix and aluminum halides, where the liquid and salt do not react with each other.

The position of the Official Action is that US '071 suggests the claimed invention, and the Official Action points to page 14 of the present specification as evidence that halides are a functional salt.

However, US '071 relates to batteries containing an anode, a cathode, and a molten, non-aqueous electrolyte wherein said electrolyte comprises an admixture of aluminum halide and 1,2,3-trialkylimidazolium halide. The aluminum halides are not functionalized salts as described in the claims and the present specification at page 6, lines 16-19, and the aluminum halides are not able to be used as soluble reaction supports as disclosed

on page 3, lines 9-11 and page 7, lines 7-12 of the specification.

As to page 14 of the present specification allegedly defining halides as functional salts, the excerpt cited by the Official Action is, "This particular case relates to the general case where a functionalized salt, for example a halide is dissolved in an ionic liquid matrix." However, the claims and the present specification define a functionalized salt as having a cation and/or an anion that is functionalized. Thus, as a halide is not a functionalized anion (see e.g., page 6, lines 16-19), the cation must be a functionalized cation for the halide salt to be a functionalized salt.

Thus, US '071 fails to disclose or suggest the claimed invention, and US '071 cannot render obvious claims 114 and 116.

Therefore, withdrawal of the rejection is respectfully requested.

Claims 79, 81-88 and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent application publication 2002/0010291 (US'291). This rejection is respectfully traversed.

US '291 is offered for teaching a mixture of a functionalized ionic liquid. The position of the Official Action is that this teaching suggests any combination of liquids, which allows for mixture where the non-functionalized ionic liquid acts

as the matrix and the functionalized ionic liquid is dissolved therein.

However, the present claims are directed to organic synthesis in a homogeneous phase on a soluble reaction support comprising dissolving a soluble reaction support in the form of a functionalized salt in a liquid matrix, which US '291 fails to disclose or suggest.

At best, US '291 discloses a process for forming polyisobutylenes, comprising employing an ionic liquid. The ionic liquids are used as initiators or as co-solvents in the polymerization reaction. In paragraph [0053], US '291 discloses an ionic liquid containing a functional group that can (1) act as a catalyst or scavenger, or (2) bind to a catalyst or a scavenger. In paragraph [0054], a mixture of the previous functionalized ionic liquid with non-functionalized ionic liquid to form useful catalyst composition is taught. However, there are no specific examples that sufficiently describe the discussion in paragraphs [0053] and [0054] that would have enabled one of ordinary skill in the art to arrive at the claimed invention.

The actual examples provided in US '291 are:

-the use of the ionic liquid 1-methyl-3-ethylimidazolium aluminum tetrachloride as a catalyst for the polymerization of isobutylene,

-the use of the ionic liquid 1-methyl-3-ethylimidazolium aluminum tetrachloride as a component of a catalyst composition also containing ethylaluminum dichloride,

-the synthesis of [1,4-bis-(3-methylimidazolium)-butane]²⁺ [bromotrichloroaluminate]²⁻,

-the synthesis of 1-ethyl-3-methylimidazolium chloro-(tris-pentafluorophenyl)-borate.

None of these four examples contains (1) the formation or the use of a functionalized ionic liquid or (2) the use of a mixture of the previous functionalized ionic liquid with non-functionalized ionic liquid.

US '291 also fails to disclose or suggest the solubility of the functionalized ionic liquid in the non-functionalized ionic liquid. In the present claims, the functionalized ionic is dissolved in the non-functionalized ionic liquid.

Additionally, US '291 also fails to disclose or suggest a homogeneous mixture of the functionalized ionic liquid with the non-functionalized ionic liquid. Examples 1 and 2 are the only two examples describing a process for forming poly-isobutylenes

that utilize an ionic liquid, but the mixtures of these examples are heterogeneous.

In Example 1, isobutylene is not soluble in the ionic liquid 1-methyl-3-ethylimidazolium aluminum tetrachloride between -40°C and -20°C.

In Example 2, the catalyst composition containing ethylaluminum dichloride and the ionic liquid 1-methyl-3-ethylimidazolium aluminum tetrachloride is not soluble in the co-solvent hexane. It is written in paragraph [0060] that "*The miscibility of the ionic liquid with the co-solvent(s) can be adjusted by changing R, R¹, R² or R³ in the above formulas for the ionic liquid to be more compatible with the co-solvent. For example if R is a long chain alkane, the ionic liquid will be more miscible with a hexane co-solvent. A long chain alkane is considered to be a C₁₀-C₁₀₀ alkyl, for example*". The ionic liquid 1-methyl-3-ethylimidazolium aluminum tetrachloride used in Example 2 does not contain such a long chain and is therefore not soluble in the hexane co-solvent.

Moreover, there is no suggestion that the ionic liquids of US '291 would have similar properties as the claimed invention. No information is given about the possibility of recycling the mixture of the functionalized ionic liquid with non-functionalized ionic liquid. As disclosed in the present specification, the claimed matrices (mixture of the

functionalized ionic liquid with non-functionalized ionic liquid) are easily recyclable (see page 2, line 15 of the specification).

Finally, the functionalized ionic liquids of US '291 are not reaction supports. The scavenger or the catalyst bound to the functionalized ionic liquid is not subsequently functionalized, and they are not released at the end of the reaction. The present claims recite a soluble reaction support, which as defined on page 3 of the specification, is "a salt dissolved in the ionic liquid matrix carrying one or more functions allowing the catching of molecules and their subsequent functionalization as well as the release at the end of the reaction sequence."

Therefore, in view of the above, US '291 cannot render obvious claim 100-124, and withdrawal of the rejection is respectfully requested.

In view of the preceding remarks, applicants believe that the present application is in condition for allowance at the time of the next official action. Allowance and passage to issue on that basis is respectfully requested.

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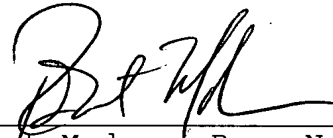
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Respectfully submitted,

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